

Design and Fabrication of Semi-Automatic Drainage Cleaner

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Abstract: Drainage systems and its role in sanitation related outbreaks are evident but still occluded once it has been installed. This current review evaluates if drainage system can cause infection and thus be of clinical concern. Improper management of drain line led to chronic diseases. To ensure adequate safe hygiene, this will help to clean drain line in superior manner that will help to maintain public hygiene.

Keywords: Drainage system, management, hygiene.

I. INTRODUCTION

Blocked drain is real problem for home owner. Not only blocked drain but the hard impurities cause resurgence of water. Thus drain system should clean time to time using manual operation. So design of automatic mechanism which will throw out wastage from drain line and keep drain clean. Automation of drainage cleaning system would reduce the risk of various diseases spread due to accumulation of waste. Thus modified drainage cleaning system will clean up waste from surface to bottom of drain by grab floating as well as waste accumulate at bottom.

Literature Survey:

As survey the electric motor power is used for operating the whole mechanism. The mechanism is consisting of Tin frame teeth's which is placed inclined to the main frame. The teeth's are supported by chain sprocket arrangement which is driven by motor. The floating material like polyethylene bags, bottles, etc are only removed with the help of teethes and dropped in store back of frame [1]. The further modification is also work to remove only floating materials from drain line. In this system the lower part is of net type structure which consists of small holes, so that only water can flow through this lower basement and material is lifted by lifter connected to chain and sprocket which is driven by AC geared motor [2]. A stable frame is made using L type angle between which grilled arrangement is done. This grill is used to pick up the floating material from the drain line which is connected to the bearing. The power is given by DC motor to sprocket by the use of chain. The motor is operated by using battery and it is charged by solar plates [3]

Proposed System

Working:

The system basically works in normal way of conveyor systems. The system consists of shaft, gears, motor, rollers, solar panel, belt and bucket. The shaft is driven by motor which operated by using solar energy. The solar panel is mounted on top of system design. The power is collected in IC modulator and supplied through battery. From shaft, power is transmitted to roller through gear arrangement.

The two rollers are connected apart from each other through belt drive on which perforated buckets are mounted through riveting joint. As system is allowed into drainage, the roller starts rotating the buckets will move inside the drainage which will goes up to material inside the drainage block. The bucket will pick up the wastage material and floating material from drain block. The bucket allow water to flow out as being perforated and only waste part will collected into storage collector behind the belt drive. This collector is provided with removal arrangement so that easy handling of waste can be done.

The system is provided with an extra arrangement of grass cutter and GPS camera. This will help in good working of system. The GPS camera will be able to work giving full view of working on screen of computer in the area it will work. This will allow automating the system and working in area where human will not able to work.

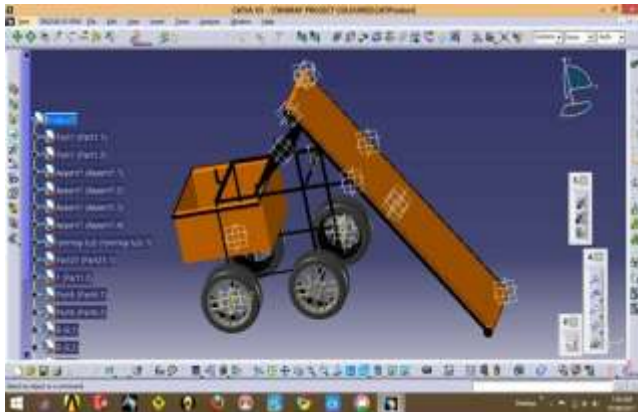


Fig 1-catia model of system

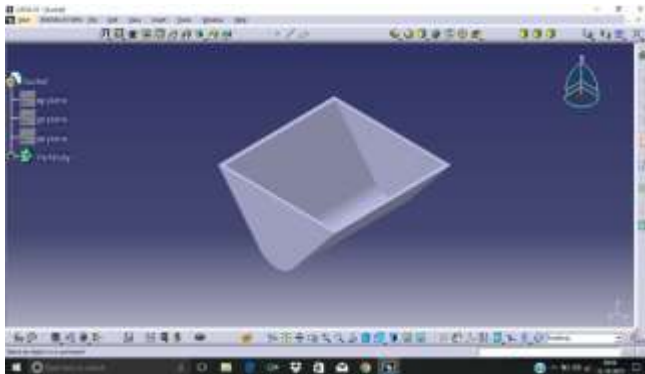


Fig 2-catia model of bucket

1.2 Methodology:

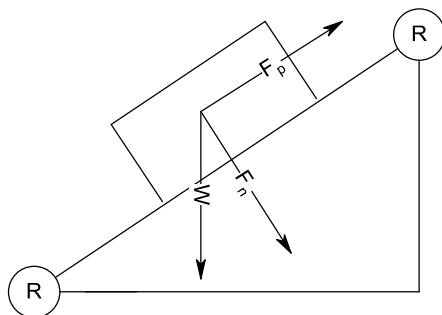


Fig 3-force diagram

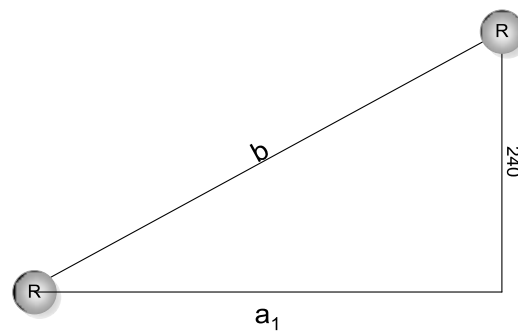


Fig 4-roller distance

Assuming, (a) mass to be lifted = 5 kg and (b) Self weight of bucket = 2 kg

Thus, Total mass = 7 kg

$\alpha = 45^\circ$, as we goes on increasing α length of belt required will be more And if goes on decreasing α length of bar will increased. So we have taken it for average size.

If height of bar is selected as 200 cm and according to survey it was found that depth of drainage is 40 to 60 cm. Thus total height is 240 cm and 10 cm clearance provided so that bucket will not stuck to bottom of drainage.

Total height = 240 cm

Now from fig,

$$\cos\theta = \frac{240}{b} \quad \text{And} \quad \tan 45 = \frac{340}{a}$$

$$b = 340 \text{ cm} \quad a_1 = 240 \text{ cm}$$

(1) Pulling forces (F_p) = $\text{mass} \times 9.81 \times \sin\alpha = 48.55 \text{ N}$ {assume mass of bucket 7 kg}

(2) Distance between two pulleys (rollers) = 340cm

(3) Velocity, $v = \frac{\text{distance}}{\text{time}} = \frac{3.4}{15} = 0.227 \text{ m/s}$ {assume time $t=15\text{sec}$ }

- (4) Acceleration, $a = \frac{v}{t} = \frac{0.227}{15} = 0.0151 \text{ m/s}^2$
- (5) Resisting force $F_r = \text{mass} \times \text{acceleration} = 1.037 \text{ N}$
- (6) Torque required, $T = F_p \times r = 165.07 \text{ Nm}$
- (7) Power required to drive, $P = \frac{2\pi NT}{60} = 2.109 \text{ kw}$

1.3 Features:

- Advantages:
 - ❖ Reducing time and human efforts.
 - ❖ Working is simple.
 - ❖ Construction of model is easy.
 - ❖ Efficient in handling.
 - ❖ Less Vibration.
 - ❖ Portability.
 - ❖ Maintenance cost is less.
 - ❖ Mechanism is adjustable as per height and length of Drain line.
- Disadvantages:
 - ❖ Initial cost is high.
- Application:
 - ❖ It can be installed for domestic drain lines treatment for Municipal Cooperation.
 - ❖ It can be installed in village Gram Panchayat for drainage cleaning.
 - ❖ It can be installed for sewage treatment in MIDC industries.

II. CONCLUSION

The proposed system is helpful in handling the blockage of drain in effective manner. As whole system is providing solution over the total cleaning of drain line not only floating material but also waste accumulates at the bottom of drain. In India, cleanliness is major issue regarding health and society. So as to provide a step in we design such system which will help to have clean society. It will also helpful in future for growing economy of Municipal Corporation.

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